As noted in Figure 26-1 the maximum heating requirements were during December of 1983 and January, 1984. It was during this time that record breaking low temperatures were registered for this area of the country.

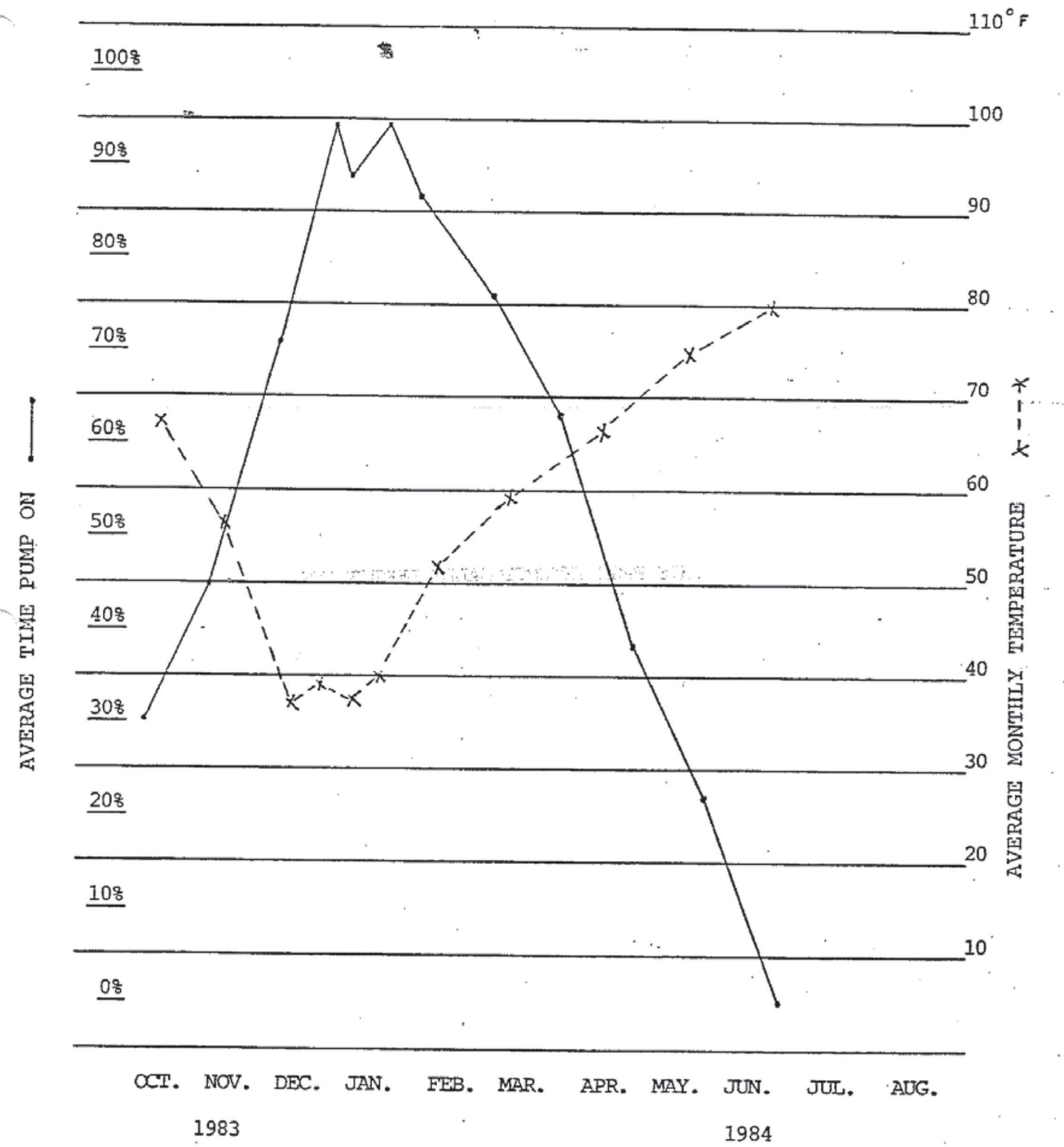
26.3 Heat Exchanger Inspection

In mid June, 1984, following eight months of continuous production, the plate heat exchanger was disassembled for routine maintenance and inspection. The plates were visually inspected for pitting, corrosion, or scaling on the geothermal and fresh water sides.

This visual inspection showed the geothermal side to be essentially free of deposits, scaling, and corrosion; the surface had a glossy metallic appearance.

Use of fresh water from the collection reservoir had resulted in a thin deposit of algae which coated the fresh water side of the plates, but a mild soap and water solution was able to remove this layer of material and restore the plates to a glossy metallic surface with no apparent pitting having occurred.

This inspection confirmed that the systems' design is efficient and will reduce or eliminate any high costs other than yearly routine maintenance and cleaning.



Percentage of Time The Geothermal Pump Was On in
Relation to Mean Ambient air temperature
Figure 26-1

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27.0 DISPOSAL SYSTEM PERFORMANCE

Disposal of the spent geothermal fluids is accomplished by flowing these fluids into an injection well (see Section 16 and 27). All spent geofluids flow by gravity into the injection well and are dispersed into the Upper Woodbine Formation.

During the eight month period of system's operation, the injection well was treated with a hundred pounds of citric acid on four separate occassions to remove salt buildup in the Woodbine Formation. The salt formations block movement of the geofluids into the Woodbine Formation. Reduced flow registers as back pressure at a gauge mounted at the injection well downhole tubing. The citric acid treatment is quick and relatively inexpensive when compared to other methods and treatments.

Conclusions were that as long as this type of treatment breaks down the salt deposits and reduces back pressure in the injection well for more than three weeks, then cost effectiveness in maintenance and operation are achieved. No other problems have been noted in the disposal system performance.

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28.0 TRANSMISSION SYSTEM PERFORMANCE

A transmission system does not exist in the Navarro College Project, this section is not applicable.

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29.0 DISTRIBUTION SYSTEM PERFORMANCE

A distribution system does not exist on the Navarro College Project, this section is not applicable.

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30.0 APPLICATION SYSTEM PERFORMANCE

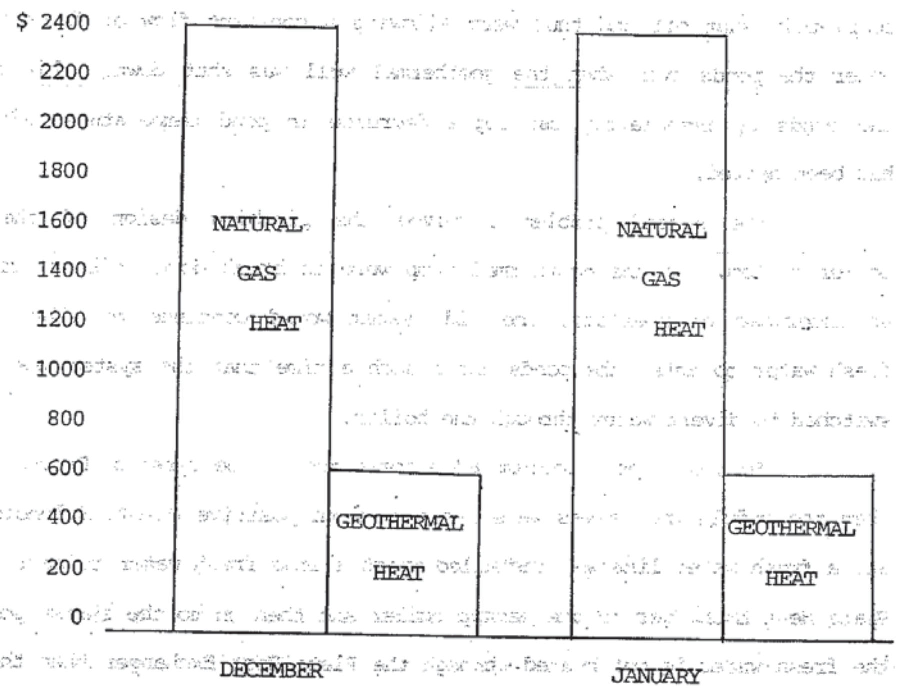
When this system came into operation in October, 1983, two components with potential performance and economic problems were discussed with the contractor and project engineers. These components were the modulating pond temperature control valves and the plumbing to the backup boiler system. It was noted that the modulating valves were not designed to completely shut off and thus were allowing a constant flow of fresh water to enter the ponds even when the geothermal well was shut down. This affected the ponds by immediately causing a decrease in pond temperatures after they had been heated.

The second problem involved the plumbing design of the backup boiler system. If the geothermal pump were to break down or kick off due to an underload or overload, the old system would continue to allow unheated fresh water to enter the ponds until such a time that the system was manually switched to divert water through the boiler.

Both of these problems were corrected by the first of December, 1983, when the modulating valves were replaced with positive On/Off Solenoid Valves and a fresh water line was installed which allows fresh water to pass from the Plate Heat Exchanger to the backup boiler and then on to the shrimp ponds. If the fresh water is not heated through the Plate Heat Exchanger then the boiler is automatically activated.

These two corrective measures have resulted in the operators expressing satisfaction with the overall system performance.

A comparision of costs per BTU's of consumption is presented in Figure 30-1. This figure shows the actual costs of operating the geothermal system during peak demand periods in December, 1983, and January, 1984. These figures reflect the actual pumping costs for the geofluids and a comparable cost for an equal amount of BTU's from a natural gas boiler.



Energy Consumption Cost Comparison
Figure 30-1

Peak heating demands (Section 14.1) show that 962,500 BTU/Hr are available from the Plate Heat Exchanger and since the average operational time for December and January was 90%, this is equal to approximately 27 heating days or 648 hrs. of ON time. Energy amounts available to the ponds equals 648 hrs. x 962,500 BTU's or 623,700,000 BTU's.

Pumping costs for December, 1983, and January, 1984, were approximately $600.00 each, which is equal to 1,039,500 BTU's/Dollar. Natural Gas prices in Corsicana are $3.8958 per 1000 cubic feet of gas with 1,030,000 BTU's available per 1000 cubic feet. This equates to approximately 264,387 BTU's/Dollar.

This type of performance reflects a savings of about 75% when compared to a conventional gas boiler heating system. In addition to meeting the demands for the shrimp ponds, the effluents provide partial heating requirements to the greenhouse.

Energy cost savings and multiple energy applications satisfy the operators in terms of application system performance.

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31.0 CONSTRUCTION COSTS

The total construction costs for the Navarro College geothermal systems is divided into two separate construction efforts. The effort reflects construction costs from 1978 through 1982 in drilling, completion, and testing of the production well. The second effort involved a bid process for facilities installation of the application system and was initiated during May, 1983. As presented in Section 24, the base bid was approximately $350,700, but subsequent purchases and modifications resulted in a final contract price of $398,953.

A breakdown of the construction cost totals is presented in Table 31-1.

Table 31-1.

Item	Amount	Subtotals
PRODUCTION SYSTEM		
° Well drilling, completion, & Testing*	$ 72,698	
° Production Pump & Panel	23,550	
		$ 96,248
DISPOSAL SYSTEM		
° Well drilling, completion, Testing, Plug-backs, & Stimulation	334,480	334,480
APPLICATION SYSTEM		
° Fencing & Mobilization	5,000	
° Catfish Reservoir Excavation	43,500	
° Site Work	7,000	
° Aqua-Pond Excavation	5,000	
° Aquaculture Building	123,000	

Item	Amount	Subtotals
° Aqua-Building Plumbing & Electrical	$ 22,000	
° Mechanical Building Structure	30,000	
° Mechanical Building Plumbing & Electrical	20,000	
° Outside Plumbing & Electrical	40,000	
° Greenhouse Site Preparation	5,000	
° Concrete Work	35,000	
° Concrete Grade Beams	5,000	
° Controls & Modifications	42,953	
° Seeding of Grass	3,576	
		$ 398,953
° Greenhouse Structure*		30,000
TOTAL CONSTRUCTION COSTS		$ 859,681

*These Items Supplied by Navarro College

Breakdown of Navarro College Geothermal
System Construction Costs
Table 31-1

32.0 OPERATING AND MAINTENANCE COSTS

Operating and maintenance (O & M) costs include labor, utility, and repair or replacement of project materials.

Labor requirements have been projected for personnel to run the system and care for each of the project segments including cultivation and harvest of all crop items. The harvested items (shrimp, produce, and catfish) have been used as a resale item in determining the economics of the system (Section 33). Labor requirements are for one full time faculty member as system operator and supervisor with one half time laborer. The cost for these two positions, which includes fringe benefits and indirect costs, is approximately $58,000.

Utility cost include parasitic electrical power, used primarily to power the system pumps and controls, and a limited supply of city water for use in the greenhouse. Electrical costs are approximately $2700 per year while water costs are $1000 per year.

The production pump and control circuits have a projected life expectancy of 10 years. A sinking fund allowance has been projected at this expectancy against a total cost of $35,000 for a yearly cost of $3500. In addition, repair or replacement of additional project elements has been estimated at $2000 per year.

A summation of these O & M costs is presented in Table 32-1.

Table 32-1.

Item	Costs
° PERSONNEL	
One Full Time Operator & Supervisor	$ 30,000
Fringe Benfits	7,800
Indirect Costs	15,000
One Half Time Laborer	5,200
° UTILITIES	
Electrical Costs	2,700
Water Supply	1,000
° REPAIR & REPLACEMENT	
Production Pump & Controls	3,500
Other Maintenance	2,000
TOTAL O & M COSTS	$ 67,200

Summary of Yearly O & M Cost Estimates
For The Navarro College Geothermal Project
Table 32-1

33.0 SYSTEM ECONOMICS

The geothermal project at Navarro College is a prototype system which has been designed primarily to investigate the technical feasibility of direct utilization of geothermal energy in a cascade application system. Since this system is a prototype operation, it should be noted that the economics of this smaller scale system will not reflect a true picture of a larger commercial operation. It has always been recognized that development costs would be incurred in this project which need not be duplicated in future projects.

To account for these development costs and to provide a truer picture of private sector incentives, capital costs for an "equivalent" system are used in the economic analysis. The first part of this analysis (33.1) will compare O & M costs of the Navarro College project to the income generated from harvested crop items. The second part of this section presents the projected system economics for a larger commercial operation.

It is also important at this point to address the fact that a significant impact on the economic attractiveness of geothermal system utilization lies in tax incentives and benefits available to commercial developers. These incentives are listed in Table 33-1.

Table 33-1.

Cost Category	Tax Treatment[1]
° Tangible Well Equipment[2]	Capitalized and Depreciated; Eligible for ITC and ETC[3].
° Intangible Drilling Costs[4]	Expensed (or capitalized, at taxpayers option).

° Design, Planning, & Bidding	Capitalized and Depreciated; apportioned among the appropriate categories and treated accordingly.
° Pump Houses & Other Equipment	Capitalized and Depreciated; eligible for ETC only.
° Disposal Equipment	Capitalized & Depreciated; eligible for ITC, assumed eligible for ETC.
All Other Construction Costs	Capitalized & Depreciated; eligible for ITC & ETC.

1 Extracted from Hederman 1981, Economic Assessment of Geothermal Direct Heat Technology: A Review of Five DOE Demonstration Projects.

2 Physical well property such as casing, valves, etc.

3 ITC = Investment Tax Credit (10%), ETC = Energy Tax Credit (15%)

4 Includes labor, fuel, repairs, hauling, supplies, etc.

Tax Treatment for Commercial Developments Using Geothermal Energy
Table 33-1

33.1 Geothermal Economics at Navarro College

In assessing the potential success of any geothermal operation, several factors need to be considered once the type of operations has been established. If the type of operation is one of space heating for buildings, then a savings over fossil fuels or electrical heat must be realized which offsets the cost of installation of the geothermal equipment. The projected pay-back on this equipment is dependent upon specific factors of the resource itself, such as quantity and quality of the geothermal fluids available. Due to these limitations it can be quickly assessed that larger operations with high energy demands which have access to large quantities of a high quality geothermal resource will prove to be more economically feasible than small prototype operations such as the one at Navarro College. The development costs incurred for this project would not show a pay-back on investment for this small of a scale operation. Yet, projections are presented in Section 33.2 which show that a larger operation would be economically feasible for this type of cascade application. Therefore, in assessing the economics for the Navarro College geothermal project, construction costs have not been considered and the following table (33-2) compares only the income from project crop items and increased student enrollment to the O & M costs.

Table 33-2.

Income From Project Elements		O & M Costs	
° Aquaculture Crops		° Personnel	$ 58,000
Shrimp (750 lbs.)	$ 6,240	° Utilities	3,700
Catfish (4500 lbs.)	5,625	° Repairs & Supplies	3,500
		° Other	2,000
° Greenhouse Crops			
Tomatoes (9600 lbs.)	7,200		
Cucumbers (2400 lbs.)	1,200		
Other	900		
° Projected New Student Enrollment Due To Facilities On Campus			
25 New Students	50,000		
TOTALS	$71,165		$ 67,200

Navarro College Geothermal Project Costs
And Income Comparison
Table 33-2

33.2 Larger Scale Aquaculture Operation Economics

The following information is based on a study to develop a 10 acre aquaculture operation requiring 2500 gallons per minute of 150°F geothermal water of potable quality.[1] The facilities include three fully cased 2,000 foot wells with pumps; 40 one fourth acre ponds with necessary piping, valves, and controls; and a hatchery and harvesting equipment. The yield on capital investment (before taxes) based on a 20 year life cycle will probably be 19.6%. A pessimistic analysis yields 9.4%, and optimistic analysis yields 31.0%. Capital investment for the project is $1,000,000 and excludes housing or amenities for employees.

33.2.1 Capital Cost

Table 33-3 summarizes capital cost, which total $1,000,000.00. Major cost items are the wells, ($270,000.00) and the deep well turbine pumps with variable speed drivers, ($200,000.00).

33.2.2 Operating Cost and Income Summary

Table 33-4 shows the first year operating cost to total $111,913.00. This will increase as labor and material cost inflate over the operating years.

Income is shown for three different levels: pessimistic ($175,000.00), probable ($245,000.00), and optimistic ($343,000.00). The difference in dollar amounts is the results of the particular combination of yield and price used as shown in Table 33-4.

---

1 Geo-Heat Center, Oregon Institute of Technology 1981; "Geothermal Aquaculture Project".

33.2.3 Simple Payback

Table 33-6, showing six to eleven year simple payback periods, is evidence that geothermal systems can be attractive to commercial developers, not only for application in space heating, but for development in the fields of aquaculture and agriculture as demonstrated by the 75% savings over natural gas costs for equivalent amounts of heat energy. These results definately indicate that commercial development of the central Texas geothermal resource can indeed be economically attractive.

Table 33-3.

Wells, 3 required, cased, 2,000 ft. deep		$270,000.00
Well pumps, 3 required, 100 hp motor, variable speed drive		200,000.00
Domestic water well and water system		10,000.00
Piping, polybutylene supply, polyvinyl chloride drain		130,000.00
Well head buildings, 3 required		20,000.00
° Ponds		
Clearing and grubbing	$ 2,000.00	
Dike construction	122,000.00	
Bottom grade and compaction	4,000.00	
	$128,000.00	128,000.00
° Access Roads		
Clearing, excavation, and grading	$ 2,000.00	
Gravel	8,000.00	
Culverts	2,000.00	
	$ 12,000.00	12,000.00
° Machinery (including office and lab)		
750 sq. ft. building	$ 13,000.00	
Equipment (including four 250 gallon tanks, aerators, filters, misc.	7,000.00	
	$ 20,000.00	20,000.00

° Initial stocking (1.5 post larvae prawns per ft^2 @ $35/1000		22,000.00
° Other equipment		
Nets and seining material	$ 1,500.00	
Recording instruments and chemicals	1,500.00	
Packing and shipping cartons	2,000.00	
	$ 5,000.00	5,000.00
° Engineering fees		30,000.00
° Misc. mechanical and electrical		15,000.00
	Subtotal	$ 862,000.00
	Contingency	138.000.00
	Total capital	$1,000,000.00

Capital Cost Summary
Table 33-3

Table 33-4.

OPERATING COST

° Electricity 836,230 KWH/year		$ 17,676.00
° Consumables		
Nets and seining material	$ 750.00	
Chemicals	500.00	
Packaging and shipping cartons	2,000.00	
Feed @ $5.00 per day, per acre	$18,250.00	
	$21,500.00	$ 21,500.00
° Labor		
1 man @ $22,000/yr	$22,000.00	
2 men @ $12,000/yr	24,000.00	
	$46,000.00	$ 46,000.00
° Maintenance		
Piping	$ 763.00	
Pumps, hatchery, bldgs.	14,086.00	
Ponds and roads	1,643.00	
	$16,491.00	$ 16,491.00
° Property taxes and insurance		$ 10,246.00
° Total operating cost (1st year)		$111,913.00

INCOME (1ST YEAR) 3 CASES

1. Minimum yield, minimum price (pessimistic) 35,000 lbs/year @ $5.00/lb =	$175,000.00
2. Maximum yield, minimum price and/or minimum yield, maximum price (probable) 49,000 lbs./year @ $5.00/lb. =	$245,000.00
35,000 lbs/year @ 7.00/lb =	$245,000.00
3. Maximum yield, maximum price (optimistic) 49,000 lbs/year @ $7.00/lb. =	$343,000.00

Operating Cost and Income Summary
Table 33-4

33.2.4 Cost Analysis

Life Cycle Cost Analysis was completed for the Aquaculture ponds using inflation rates as follows:

Electricity:	7.9% through 1988 9.1% from 1989 through 2001
Consumables, labor, and maintenance:	7%
Insurance:	2%
Sales price:	7%

Table 33-5 shows the annual costs for a 20 year life cycle as follows:

Column:
1. Geothermal Electrical
2. Consumables
3. Labor
4. Maintenance
5. Insurance
6. Total Geothermal Cost

The rate of return on invested capital, assuming 100% equity financing, is 31% for a yield of 49,000 pounds annually at a price of $7.00 per pound.

If the assumption is made that only 35,000 pounds per year can be produced and sold at $5.00 per pound, the rate of return drops to 9.4%.

Either a yeild of 35,000 pounds at $7.00 per pound or 49,000 pounds at $5.00 per pound, provides rates of return of 19.6%.

The best case is presented in Table 33-6 Column 1 and 2, followed by the worst case, Columns 3 and 4 Table 33-6, and the probable case Column 5 and 6 Table 33-6. Year of simple payback is indicated by an * appearing on the right side of the annual cash flow year that payback occurs.

Table 33-6:

Column:
1. Sales for 49,000 lbs, @ $7/lb.
2. Net Cash Flow
3. Sales for 35,000 lbs. @ $5/lb.
4. Net Cash Flow
5. Sales for either 35,000 lbs. @ $7/lb. or 49,000 lbs. @ $5/lb.
6. Net Cash Flow

Table 33-5.

Electricity Geothermal System	Consumable Materials	Labor	Maintenance	Insurance	Total Cost Geothermal System
17676	21500	46000	16491	10246	
19072	23005	49220	17645	10451	119394
20579	24615	52665	18881	10660	127400
22205	26338	56352	20202	10873	135971
23959	28182	60297	21616	11091	145145
25852	30155	64517	23129	11312	154966
27894	32266	69034	24749	11539	165481
30432	34524	73866	26481	11769	177073
33202	36941	79037	28335	12005	189519
36223	39527	84569	30318	12245	202882
39520	42294	90489	32440	12490	217232
43116	45254	96823	34711	12740	232644
47039	48422	103601	37141	12994	249198
51320	51812	110853	39741	13254	266979
55990	55438	118613	42523	13519	286083
61085	59319	126915	45499	13790	306609
66644	63472	135800	48684	14066	328665
72708	67915	145305	52092	14347	352367
79325	72669	155477	55738	14634	377843
86543	77755	166360	59640	14926	405226
94419	83198	178005	63815	15225	434663
937128	943101	2017798	723381	253930	4875338

Aquaculture Life Cycle O & M Cost
Table 33-5

Table 33-6.

	Sales For 49,000 lbs. @ $7.00/lb	Net Cash Flow	Sales For 35,000 lbs. @ $5.00/lb	Net Cash Flow	Sales For 35K lbs @$7/lb or 49K lbs @$5/lb	Net Cash Flow
	367010	247616	187250	67856	262150	142756
	392701	265300	200358	72957	280501	153100
	420190	284219	214383	78412	300136	164165
	449603	304458*	229389	84245	321145	176000
	481075	326109	245447	90481	343625	188659
	514751	349270	262628	97147	367679	202198*
	550783	373710	281012	103939	393416	216343
	589338	399819	300683	111164	420956	231437
	630692	427769	321730	118848	450423	247540
	674733	457561	344251	127019	461952	264720
	721904	489320	308349	135705*	515689	283045
	772502	523304	451243	165160	631741	345658
	826577	559597	421723	176222	675963	369354
	884437	598354	451243	165160	631741	345658
	946348	639739	482831	176222	675963	369354
	1012592	683928	516629	187964	723280	394616
	1083474	731106	552793	100425	773910	421542
	1159317	781474	591488	213646	838083	450241
	1240469	635243	632892	227667	886049	480824
	1327302	892639	677195	242532	948073	513410
TOTAL	15045756	10170417	7676406	2801068	10746968	5871630
SIMPLE PAYBACK		4 years		11 years		6 years
RATE OF RETURN		31%		9.42		19.6%

*Simple Payback Year

Aquaculture Life Cycle Cost Income
Table 33-6

34.0 PUBLIC AWARENESS PROGRAM*

34.1 Objectives

The success of a demonstration, or prototype, project that applies a new technology is dependant upon two functions: 1) The technical quality of design, construction and operation of the project; and 2) communication of the technical success and the feasibility of its application on a broader scale and a commercial basis. The Public Awareness Program was the principal means of performing this second function in accordance with DOE's original PON objectives.

This program had two primary objectives:

- ° To attract potential users of low temperature geothermal energy, and
- ° To inform the general public of the Navarro College project, in particular, and to the use of low temperature geothermal energy in general.

34.2 Program Elements

The formal Public Awareness Program was active over the entire project term and ended with completion of the audio/visual slide show in August of 1984. However, the public awareness function is an ongoing activity that will continue in the future. The success of the Public Awareness Program was, and is, largely due to the willingness and ability of the Colleges' administration to respond to the news media and public inquiries.

As the college conducted the program over the project period, a basic plan was followed and the following elements were created to implement the program objectives.

* This section describes an effort which is unique to the Navarro College project and which is in addition to the "standard" DOE PON outline in this report.

Navarro College to someday reap aquaculture harvest

Cafeteria patrons may dine on project fare

8A — THURSDAY JULY 15 1982

Aquaculture project explained

Keenan Smith, aquaculture consultant for the Navarro College aquaculture project, was the guest speaker at the Wednesday morning meeting of the Navarro County Ag Workers Association.

Project builds NC reputation

Navarro College hosts shrimp lunch

THURSDAY, JUNE 21, 1984 — 8A

College raises shrimp in energy study

By CHRISTY GROSZEK
Corsicana Daily Sun

Geothermal energy used to grow prawns

By Christy Groszek
Corsicana Daily Sun

CORSICANA, Texas — Shrimp — freshwater prawns, technically — are being raised at Navarro College as part of a Department of Energy-funded aquaculture research project that makes use of geothermal resources.

About 18,000 nearly transparent, post-larval prawns were released recently into two one-eighth-acre grow-out ponds housed in a long Quonset hut-type building in the northwest corner of the campus.

The quarter-inch-long prawns will grow to an edible size — when their tails are 3 to 4 inches long — in about seven months, said Kenan Smith, coordinator of the Navarro College aquaculture project.

The prawns will be harvested after seven months to a year, as the prawns grow at various rates. Nets with specially sized mesh that al-

Associated P.

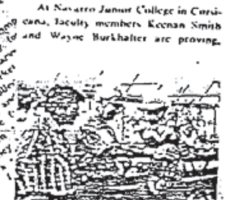
Kenan Smith dips into the prawn pond at Navarro Col-

NATURAL HEA

Tomatoes, catfish, and shrimp all get geothermal bo

It's amazing what you can do with a little hot water.

At Navarro Junior College in Corsicana, faculty members Keenan Smith and Wayne Burkhalter are proving,



through a pilot program, th natural energy can be u mighty creative ways whe their mind to the task.

The college in the le nity - surrounded by Nav. Electric Cooperative has for implementing a solar de project. And now, using thermal water, a shrimp, ve catfish production demons ject plows new scientific provides a truly innovativ study for students.

Everybody knows for at to, according to Smith and that plant and animal va best when the "just-right" is provided.

A geothermal well on ca hot water to the surface. " it?" you ask. Well, it's hot excess of 120 degrees F.

The water is piped from heat exchanger which wa water piped from a public geothermal water is then ret earth through an injection w ing with environmental regul

College's revolutionary project puts shrimp, catfish in hot water

By KAREN SVENDSEN

Shrimp make college debut

By CHRISTY GROSZEK
Sun Staff Writer

Beef may be one of the main products of Texas, but another meat animal made an "appearance" at Navarro College this week.

Shrimp — freshwater prawns, technically — will be raised at the college as part of a Department of Energy funded aquaculture research project that makes use of geothermal resources.

About 18,000 nearly transparent, post-larval prawns were released Thursday into the two one-eighth acre grow-out ponds housed in a long, Quonset-type building in the northwest corner of the campus. The quarter-inch long prawns will grow to an edible size — when their tails are 3-4 inches long — in about seven months, said Kenan Smith, coordinator of the Navarro College aquaculture project.

Harvesting of the prawns will be done from seven months to a year from now as the prawns grow at various rates. Nets with specially sized mesh that allows the undersized prawns to slip through, but retains those of an edible size, are used to seine the prawns out of the ponds.

Since the shrimp-growing project is mainly for research purposes, the harvested animals will not be marketed but will be used by the college cafeteria system for faculty and students.

The freshwater prawns differ from

ly are bigger and have a much sweeter, less fishy flavor and firmer textured meat. "It has more of a nutty, buttery taste," said Smith.

The 30- to 45-day-old prawns were shipped by air freight from a breeder in Hawaii. Since the prawns require salt-water to breed and the college does not have the funds to set up a breeding operation at this time, the project will consist of a harvest and re-stock operation at present.

Research results of the project will be reported to the Department of Energy.

The role of geothermal energy in the project is heating fresh water to a temperature conducive to growth for the shrimp. Heated waters — 125 degrees Fareheight — tapped from 2,600 feet under the earth's surface are pumped from a geothermal well located on the college campus.

Passing through a heat exchanger that keeps the two types of water separate, the geothermally heated water, which is saturated with heavy metals and salts that are detrimental to animal and plant life, heats fresh water to a temperature of about 84 degrees. The heated fresh water will flow into the two grow-out ponds to maintain a temperature between 80-84 degrees.

The multi-level aquaculture project also includes a catfish farming operation, a greenhouse for growing ornamental plants and fresh produce, and an experimental irrigation

Navarro College project harvested

By KAREN SVENDSEN

CORSICANA — For the past six years, people in Corsicana have been saying Navarro College is in hot water.

Last week almost 100 trustees, administrators and city officials gathered at the college to study the situation. What they found was a geothermal energy project that has the potential to revolutionize the inland fishing industry.

The project included shrimp and catfish kept in geothermal waters and greenhouse tomato plants kept warm by the same waters.

"Today marks an historic occasion for Navarro College and the citizens of Navarro County," said Dr Kenneth Walker, college president. "An experimental project which began six years ago and was backed by vision, belief, determination, positive thinking and money, is today a success."

The project is not completed, however. Although officials have proven using geothermal energy is technically feasible

Aquaculture, hydropon new watchwords at colle

Research results of the project will be reported to the Department of Energy, which will use them to stimulate the interest of the private sector in using geothermal energy for aquaculture, Smith said.

Geothermal energy in the project heats fresh water to a temperature conducive to growth for the shrimp. Heated water (125 degrees Fahrenheit) tapped from 2600 feet under the Earth's surface are pumped from a geothermal well on the college campus.

Passing through a heat exchanger that keeps the two types of water separate, the geothermally heated water, which is saturated with heavy metals and salts that are detrimental to animal and plant life, heats fresh water to a temperature of about 84 degrees.

Distributed by Associated Press

° Press Releases	Immediately before or after important project milestones.
° Fact Sheets	Summarized important features of the project.
° Site Signs	Site identification and public data on project purposes, scope, participants, and sponsors.
° Information Dissemination	Mailing of information on aguaculture or geothermal uses to written or requested inquiries.
° Tours	Conducted site tours to potential developers of geothermal systems.
° Audio/Visual Show	An automated presentation for release to media, visitors, and other speaking engagements.

34.2.1 Press Releases

News releases were distributed at important milestones during the course of the project and included: 1) at the conclusion of the contract-signing agreement with DOE; 2) after successful completion of the geothermal well; 3) at construction and dedication ceremonies; and 4) at harvest ceremonies marking the successful completion of the operational phase of the project. A collage of these releases is in this report (Figure 34-1). All news releases were carried by local and regional papers and were also distributed outside the state through the Associated Wire Service.

In addition to coverage through newspapers, the dedication and harvest ceremonies were attended, and covered, by the representatives from WFAA channel 8 of Dallas, Texas and KXAS Channel 5 of Fort Worth, Texas. These broadcasts were then released to nation wide affiliate stations for